Characterizing PCB contamination in Painted Concrete and Substrates: The "Painted History" at Army Industrial Sites

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Report Documentation Page

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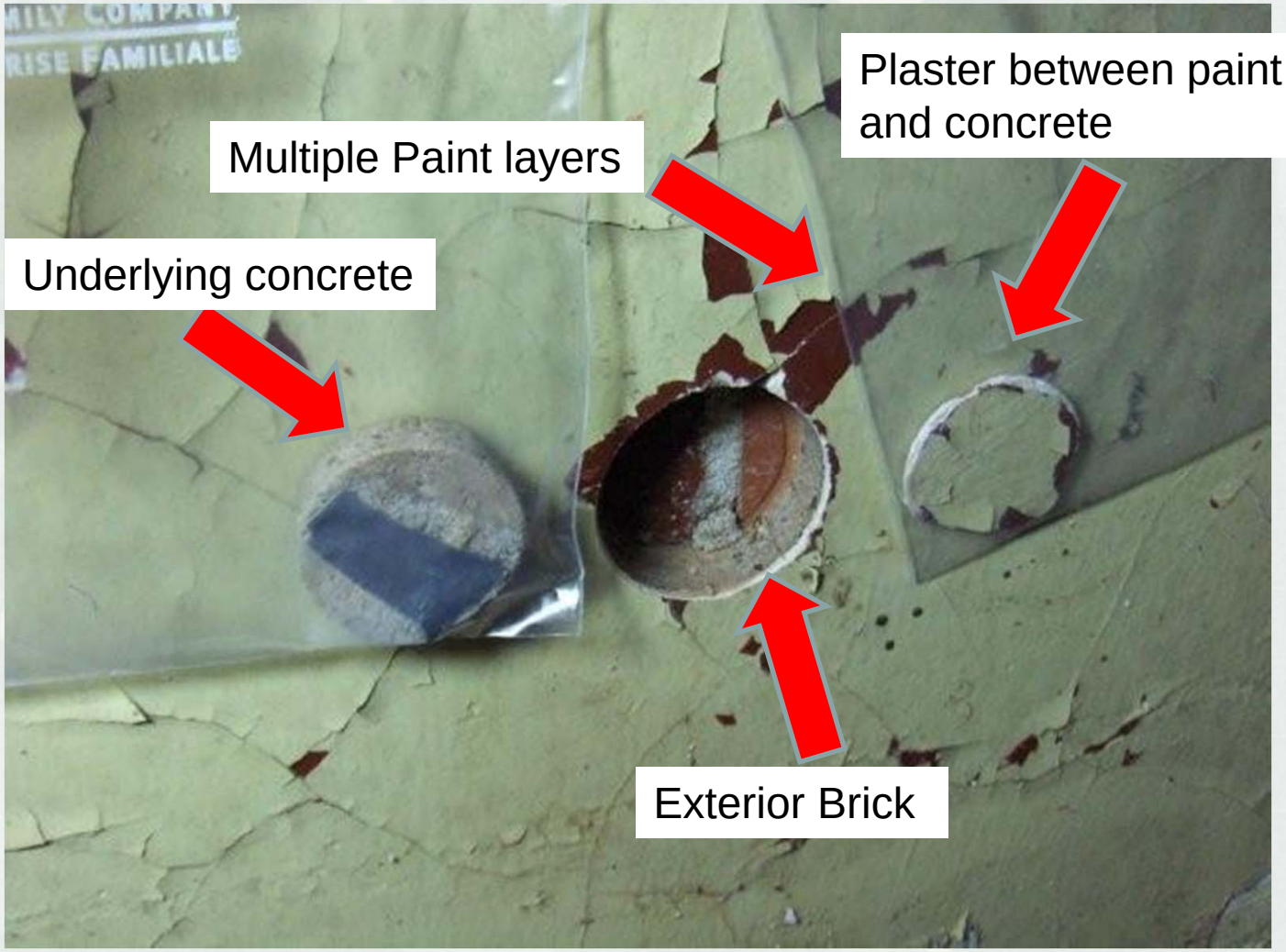
Paint History Defined:

- PCB's have been historically used as a plasticizer in building materials.
- Principally arochlor 1254 was used in the past in paint when thermal and chemical resistance was desired. Paint and lacquer formulations specified up to 10% Aroclor 1254 yielding possible dry weights of up to 25% or 250,000 mg/kg.
- The paint histories of the building lines have be defined by EPA as each paint color per building per building material/substrate. (i.e. the paint is the source)
- For buildings that have painted walls up to and over 1 foot thick, representative core samples are required in order to accurately represent the PCB levels in the substrate and combined media

ERDC Composite Defined:



PCB in Paint and Substrate

Some of these building materials were over 1 foot thick.

Other Porous Media (wood, gypsum, chipboard)

The “Painted History”

- **July 2008** –Collected paint and substrate samples of 3 inactive non-explosive building lines slated for demolition, in order to determine if the buildings contained PCBs

- **July 2009** – The July 2008 sample results indicated that some of the buildings contain paint with levels of PCBs greater that 50 mg/kg. Therefore **“composite”** (paint and painted substrate) were collected and analyzed “.

- **April 2010** – Only buildings with “composite” levels less than 50 mg/kg were demolished. For **Buildings** with composite results above 50 mg/kg it was ascertained that PCBs were released “migrated” to the substrate and became considered to be PCB Remediation Waste, halting demolition and be disposal on in a Municipal Solid Waste Landfill.

- **May 2010** –EPA site visit to see the demolition efforts and remaining structures with regulatory issues. During this visit, the EPA was shown that previous sample collection efforts were not representative.

2009 Composites Samples Not Representative

Samples Not Representative

Problem(s):

- The 2008 and 2009 concrete samples were not representative of the waste stream.
- The 2009 composite sampling report states that 1 inch in diameter by ½ to ¾ inch deep core samples were collected. However, some of these building materials were over 1 foot thick.
- A site visit was conducted to assess the 2008 sampling locations and it was discovered that the substrate samples had only the first couple of milliliters of material collected, apparently by hammer and chisel.

Data Irregularity

- Example, composite sample of concrete building material in building 9-62. The composite sample result is 606 ppm PCB, which is higher than the paint sample result of 117 ppm.

- Bottom Line: The data is suspect.

- Impact: These data are at the heart of an EPA/Army informal dispute that is over 2 years old, has been elevated to both party's headquarters, and is still not resolved.

- **This conflict has made the site ineligible for millions of dollars in FRP funds!**

PCB bulk waste product OR PCB remediation waste?

Building #	Composite Sample Result for PCBs (mg/kg or ppm)	Substrate Material	2008 Paint Result	2008 Substrate Result
5A-25	408 N	Concrete	7770	18
5A-26	143	Concrete	2670	76
5A-55	195.4 J	Plaster	4290	ND
5B-21	68.2	Plaster	1930	ND
5B-55 (Red)	64.5 J	Plaster	2710	19
5B-55 (Green)	366 N	Plaster	2820	12
5B-137 (Blue)	194 N	Gypsum	1040	139
5B-137(Yellow)	198 N	Chipboard	1100	52
5B-137(Blue)	660 J	Chipboard	605	15
9-62	606 J	Concrete	117	ND
9-64 (green)	1365	Wood	3190	ND
9-64(Green o Red)	462.2 J	Concrete	7960	218

Samples Not Representative - The 2008 and 2009 concrete samples were not representative of the waste stream.

Impact:

- Site ineligible for millions of dollars in FRP funds
- Buildings remain at site

PCB bulk waste product OR PCB remediation waste?

- EPA TSCA guidance states painted demolition debris as PCB bulk waste product and may be disposed of in a municipal solid waste
- EPA region 7 claims PCB remediation waste as PCB's from the paint may have migrated into the substrate constituting a "spill"
- Army does not agree that painting a building material constitutes a spill or release, nor does the physical processes of paint drying and settling into the pores of a structural material

Site Investigation at IAAAP

- A case study at Iowa Army Ammunition Plant IAAAP was performed with the “Paint Histories” in which the walls of industrial concrete and porous building materials were sampled and analyzed for PCB contamination

- **November 2010** ERDC re-sampled the buildings using a coring machine, as opposed to previous sampling efforts that used hand tools. The 2008 and 2009 concrete samples were not representative of the waste stream.

ERDC Sampling Strategy

Through providing an accurate representation of the extent of PCB contamination on painted building materials, a scientifically valid characterization can be provided

PCB in Paint and Substrate

The 2009 composite sampling report states that 1 inch in diameter by ½ to ¾ inch deep core samples were collected.

2010 Representative Sample

2008 Results (4 Buildings)

Building #	Paint Result (mg/kg or ppm)	Substrate Result (mg/kg or ppm)	Substrate Material	Paint Color
5A-21	795	210	plaster	Beige on Red on Green
5A-26	2670	76	concrete	Yellow
5B-137-2	1040	139	gypsum	Blue
5B-137-2	1100	52	chipboard	yellow
9-64	7960	218	concrete	Green

2008 Results vs. 2010 Results (3 of 4 Buildings Below 50mg/kg action limit)

Building #	2008 Paint PCB Result (mg/kg)	2008 Substrate Result (mg/kg)	Substrate Material	Paint Color	2010 Paint Result (mg/kg)	2010 Substrate Result (mg.kg)
5A-21	795	210	plaster	Beige on Red on Green	240	0.35
5A-26	2670	76	concrete	Yellow	10,000	9.6
5B-137-2	1040	139	gypsum	Blue	210	**260**
5B-137-2	1100	52	chipboard	yellow	450	**170**
9-64	7960	218	concrete	Green	950	0.99

Project Summary

Where surface paint concentrations of 290 mg/kg were observed, only 2 mg/Kg was present in the plaster directly beneath the paint.

gradients in concentration with depth were not observed in the data

- **All 2010 substrate sampling results for plaster and concrete are less than 50 mg/kg**
- The 2010 results are orders of magnitude less than the 2008
- Bottom line, no indication of migration

Conclusions

- True sample cores were taken that revealed surface paint as the source of PCB contamination with negligible diffusion into underlying concrete, as declining gradients in concentration with depth were not observed in the data.
- Consequently the potential for migration into the underlying Substrate differs considerably from a scenario such as transformer oil spills onto a concrete slab.
- However samples from wood and other porous materials (e.g. gypsum, chipboard) indicated diffusion into the substrate.
- Such information has considerable regulatory and financial significance in assessing whether the site is classified as PCB bulk waste product or PCB remediation waste.

Questions?